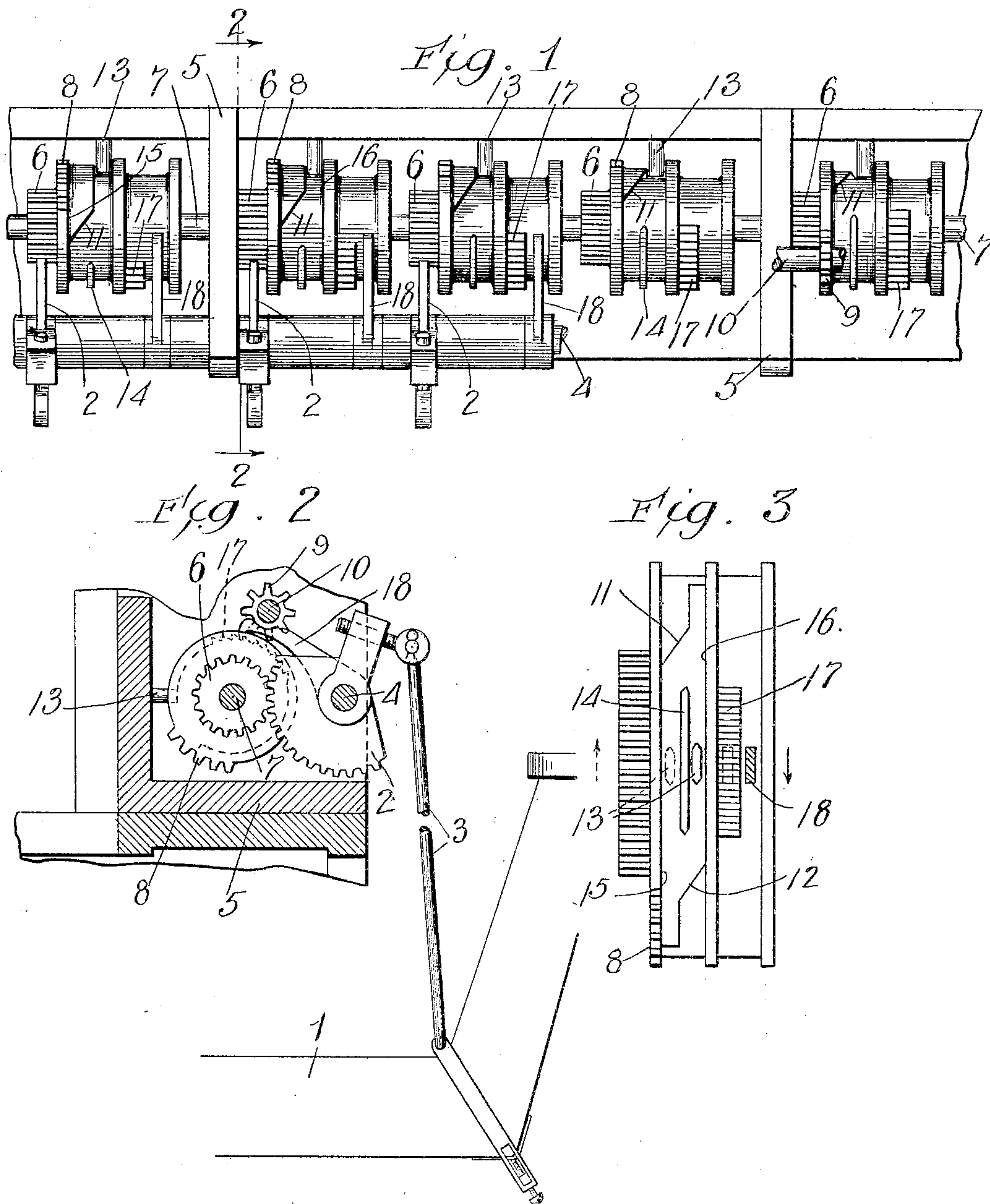


No. 804,463.

PATENTED NOV. 14, 1905.

H. E. GOLDBERG.
CALCULATING MACHINE.
APPLICATION FILED JULY 24, 1905.



Witnesses

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CALCULATING-MACHINE.

No. 804,463.

Specification of Letters Patent.

Patented Nov. 14, 1905.

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To all whom it may concern:

Be it known that I, HYMAN ELI GOLDBERG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Calculating-Machines, of which the following is a specification.

My invention relates to the actuating devices of calculating-machines; and it consists more especially in improvements in connection with the digit-pieces shown and described in Patent No. 782,554, issued to me February 14, 1905.

The objects of the present invention are, first, to prevent accidental shifting of the digit-piece and, second, to provide means for compelling the completion of the upstroke of the key.

I attain my objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a number of digit-pieces and their connections embodying the invention. Fig. 2 is a transverse view, partly in section, looking in the direction of the arrows on line 2 2, Fig. 1. Fig. 3 is a development of the peripheral surfaces of a digit-piece, showing how the same would look if laid out flat.

Similar numerals refer to similar parts throughout the several views.

The keys 1 are connected to the driving-sectors 2 by the links 3 or other suitable means. Said sectors are laterally stationary and independently rotatable upon the shaft 4, which is secured in the machine-framework 5. The driving-sectors are adapted to mesh with the gears 6, which constitute a part of the digit-pieces. The faces of each of said gears 6 are wide enough so that notwithstanding its shifting it always remains in mesh with sectors 2. The digit-pieces are independently rotatable and independently shiftable upon the shaft 7, which is secured in the machine-framework 5.

Each digit-piece has a toothed portion 8, which may be termed a "digit-sector," the number of teeth in each case depending upon the value of the key by which it is actuated. Each of said digit-sectors is designed to mesh during its positive stroke with one of the digit-pinions 9, rigidly fixed on the shaft 10. Said shaft is journaled in the machine-frame and may be termed a "universal member" because all of the digit-pieces are operative upon it. It has always a definite amount of

rotation, depending upon which figure-key is at the time being driving it.

In order that the universal shaft 10 may rotate always one way and remain still during the return rotation of the oscillating digit-pieces which rotate back and forth, means are provided for shifting the digit-pieces so that the digit-sectors will during their forward or positive rotation be in line with the digit-pinions 9 to rotate the latter, but will during their return rotation be out of line with said pinions. This shift is accomplished by means of the two cam-surfaces 11 and 12 of the digit-piece, which cam-surfaces act upon the pins 13, fixed in the machine-frame. The cam 11 shifts the digit-pieces so as to bring the digit-sectors out of line with the digit-pinions and may therefore be termed the "out-shifting-cam," and the cam 12 shifts the digit-pieces, so as to bring the digit-sectors back into line prior to the next positive stroke, and may therefore be termed the "inshifting-cam." It is obvious that in order to give time for the digit-sector to complete its idle return movement after it has been shifted out of line the cams 11 and 12 must be located at some distance apart, and in the meantime the digit-piece must not shift sidewise. In the form of digit-piece shown in the above-mentioned patent no special means is shown for positively preventing such accidental shifting, the supposition being that as there is nothing in the mechanism to create a tendency for the digit-piece to shift prematurely such shifting would be prevented by mere inertia and the friction of the digit-piece upon its contacting members. As a matter of fact, except in rare cases, no premature or accidental shifting does occur; but in the present construction it is positively prevented by the dividing rib or wall 14, which is rigidly formed on the digit-piece between the two paths which the pin 13 traverses as the digit-piece rotates past it. In the preferred construction two peripheral walls 15 and 16 are also provided on the digit-piece for coöperating with the cams 11 and 12 and wall 14 in controlling the lateral position of the digit-piece upon the shaft. The function of the walls 15 and 16, however, is largely to prevent excess shifting, and it is obvious that this limiting of the shift may be obtained by stationary stops in a variety of ways.

In the correct operation of the mechanism a digit-piece during its return rotation is now active, so that as far as anything thus far described is concerned another digit-piece

might commence to operate before the previous one had completely finished its return movement; but in order that the calculating parts may operate properly it is necessary
 5 that a digit-piece should sufficiently complete its return rotation, and as this return rotation occurs during the upstroke of the key the key must sufficiently complete its upstroke. It has been found in practice that in calculating num-
 10 bers wherein digits are repeated—*e. g.*, “888” or “775”—some operators are in the habit of not removing their finger from the key, and consequently not permitting the digit-piece to return a sufficient amount before again
 15 depressing the key. This results in errors; and in order to compel the operator to permit the key to rise sufficiently mechanism is provided for preventing a second depression until the first upstroke is completed. For this pur-
 20 pose the digit-pieces are provided with ratchet-teeth 17, adapted to be engaged by the dogs 18. Each dog is pivotally mounted upon a fixed pivot, in the present instance shaft 4, and is laterally non-shiftable, so that the shift-
 25 ing of a digit-piece brings the ratchet thereof into and out of line with said dog.

To illustrate the operation of the parts, take the example illustrated in the drawings, in which the downward motion of the key will
 30 cause an anticlockwise rotation of the digit-piece. It is during this period that the digit-sector acts upon the respective digit-pinion 9, the digit-piece lies at the left, and the ratchet is out of line with the pawl 18. After
 35 the digit-pinion has its rotation completed by the digit-sector the cam 12 comes into play and causes the digit-piece to be shifted to the right. This brings the path at the left side of wall 14 into line with pin 13 for the return
 40 rotation and also brings the ratchet 17 into line with pawl 18; but the ratchet-teeth are so faced that during this return or backward rotation of the digit-piece the pawl will slip over said teeth without engaging them. Con-
 45 sequently the return rotation is not interfered with if the parts operate as intended. But suppose the operator should attempt to depress the key before the digit-piece has completed its return stroke—in other words,
 50 while the ratchet-teeth are still in line with the pawl. The parts would then occupy the relation shown by the dotted lines, Fig. 3, with pin 13 in the groove at the left and the ratchet in line with the dog 18; but now the
 55 ratchet is moving in the opposite direction to the one before when in line with the dog, for the digit-piece is now rotating in a forward instead of return direction and the ratchet-teeth are opposed to said dog. The result is
 60 that the digit-piece is immediately arrested and the operator is unable to depress the key until he has first let it rise sufficiently to complete the operation of the calculating parts.

I claim—

65 1. In actuating mechanism for calculating-

machines, a rotatable universal member rotat-
 ing different amounts depending upon the
 value of the digit to be registered; a rotatable
 member for actuating the same said rotatable
 member being shiftable into and out of con- 70
 nection with said universal member; means
 for shifting said shiftable rotatable member
 into connection with said universal member;
 means for shifting said shiftable rotatable
 member out of connection with said universal 75
 member; and other means for meantime pre-
 venting the shifting of said shiftable rotatable
 member.

2. In actuating mechanism for calculating-
 machines, a rotatable universal member rotat- 80
 ing different amounts depending upon the
 value of the digit to be registered; a rotatable
 member for actuating the same said rotatable
 member being shiftable into and out of con-
 nection with said universal member; a cam for 85
 shifting said shiftable rotatable member out
 of connection with said universal member; a
 cam for shifting said shiftable rotatable mem-
 ber into connection with said universal mem-
 ber; and other means for meantime prevent- 90
 ing the shifting of said shiftable rotatable
 member.

3. In actuating mechanism for calculating-
 machines, a rotatable universal member rotat- 95
 ing different amounts depending upon the
 value of the digit to be registered; a rotatable
 member for actuating the same, said rotatable
 member being shiftable into and out of con-
 nection with the universal member; and a sta-
 tionary member adapted to contact said shift- 100
 able rotatable member for shifting it, one of
 said last two members having a pin or pro-
 jection and the other having two cams remote
 from each other and adapted to contact said
 pin to shift said shiftable member, the said 105
 member which bears the cams having means
 for preventing shifting during the intervals
 between the actions of the cams.

4. In actuating mechanism for calculating-
 machines, a rotatable universal member rotat- 110
 ing different amounts depending upon the
 value of the digit to be registered; a rotatable
 member for actuating the same, said rotata-
 ble member being shiftable into and out of
 connection with the universal member; and a 115
 stationary member adapted to contact said
 shiftable rotatable member for shifting it, one
 of said last two members having a pin or pro-
 jection and the other having two cams remote
 from each other and adapted to contact said 120
 pin to shift said shiftable member, the said
 member which bears the cams having a divid-
 ing-wall arranged between the same for pre-
 venting shifting during the intervals between
 the actions of the cams. 125

5. In actuating mechanism for calculating-
 machines, a rotatable universal member rotat-
 ing different amounts depending upon the
 value of the digit to be registered; a shiftable
 digit-piece for actuating the same and a slot- 130

and-pin device for shifting said digit-piece into and out of connection with said universal member the slot being double, in part, for retaining the digit-piece for a time in each of its shifted positions.

6. In actuating mechanism for calculating-machines, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a shiftable digit-piece for actuating the same, said digit-piece having two cams thereon at some distance from each other for shifting said digit-piece into and out of connection with said universal member; and a stationary pin adapted to act upon said cams to shift the digit-piece, said digit-piece also having a wall extending around its periphery almost from one cam to the other for preventing premature shifting of the digit-piece.

7. In actuating mechanism for calculating-machines, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a shiftable digit-piece for actuating the same; and means for controlling the lateral position of said shiftable rotatable member said controlling means including two cam-surfaces oblique to the axis of the shiftable rotatable member and a plurality of plane surfaces perpendicular to said axis, together with means for co-acting with said oblique and plane surfaces.

8. In a calculating-machine; a digit-pinion shaft for setting up the digits; a series of digit-pinions fixed to said shaft; laterally-shiftable digit-pieces for operating said pinions; means for independently rotating said digit-pieces; means for shifting said digit-pieces laterally into and out of operative line with said digit-pinions to thereby drive said digit-pinions and shaft in one direction only; and means for each digit-piece for preventing accidental shifting thereof said preventing means comprising two coacting portions one of which has a plurality of surfaces perpendicular to the axis of the digit-pieces.

9. In a calculating-machine; a digit-pinion shaft for setting up the digits; a series of digit-pinions fixed to said shaft; laterally-shiftable digit-pieces for operating said pinions; means for independently rotating said digit-pieces; means for shifting said digit-pieces laterally into and out of operative line with said digit-pinions to thereby drive said digit-pinions and shaft in one direction only, and a slot-and-pin device for each digit-piece for preventing accidental shifting thereof, the slotted part having plane surfaces perpendicular to the axis of said digit-piece.

10. In actuating mechanism for calculating-machines, a key-operated toothed driving-sector, a set of shiftable and rotatable digit-pieces operated thereby, and having a wide-face gear always in mesh with the driving-sector irrespective of the lateral position of the latter; a universal member, a set of digit-

pinions on said universal member one for each digit-piece; a digit-sector on each digit-piece for driving said digit-pinions when in line therewith and leaving them still when not in line therewith; pins; cams on each digit-piece adapted to contact one of said pins for shifting the respective digit-sector into and out of line with its digit-pinion and a wall extending circumferentially on each digit-piece, part way from one cam to the other and adapted to contact said pin for preventing premature shifting of the digit-piece.

11. In actuating mechanism for calculating-machines, a key-operated toothed driving-sector, a shiftable and rotatable digit-piece operated thereby and having a wide face-gear always in mesh with the driving-sector irrespective of the lateral position of the latter; a digit-pinion, a digit-sector on said digit-piece adapted to drive said digit-pinion when in line therewith and leaving it still when not in line therewith; a stationary pin; cams on said digit-piece adapted to contact said pin for shifting the digit-sector into and out of line with said digit-pinion; a wall extending circumferentially on the digit-piece, part way from one cam to the other and adapted to contact said wall for preventing premature shifting of the digit-sector, and two other walls on said digit-piece one leading up to each of said cams, said last two walls being also adapted to contact said pin for preventing excess shifting of the digit-piece.

12. In actuating mechanism for calculating-machines a set of independently-rotatable and independently-shiftable digit-pieces each having two shifting-cams thereon with a dividing-wall between them; and stationary pins adapted to coact with said cams to effect the shifting of the digit-pieces and to coact with said wall to prevent shifting of the digit-pieces intermediate of the actions of the cams.

13. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a reciprocatory digit-piece movable forward and backward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece, into connection with said universal member for the forward movement of the digit-piece, and out of connection for the backward movement of the digit-piece, and means for preventing the forward movement of said digit-piece when the latter is out of connection with said universal member.

14. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal

member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece, and means for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member.

15. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece, and means for preventing the forward rotation of said digit-piece, when the latter is out of connection with said universal member.

16. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece, and means for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member, said preventing means being rendered operative or non-operative by the digit-piece and being operative when the digit-piece is in one lateral position and non-operative in the other lateral position substantially as described.

17. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece, and a ratchet-and-pawl device for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member.

18. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece, a ratchet and a pawl for preventing the forward rotation of

said digit-piece when the latter is out of connection with said universal member, said ratchet and pawl being relatively shiftable for moving into and out of the line of engagement.

19. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece; a ratchet and a pawl for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member, said ratchet being shiftable into and out of line with said pawl.

20. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member for the forward rotation of the digit-piece, and out of connection for the backward rotation of the digit-piece; a ratchet and a pawl for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member, said ratchet being mounted upon the digit-piece and being shiftable therewith into and out of line with said pawl.

21. In combination, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable backward and forward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for shifting said digit-piece into connection with the universal member and out of connection for the backward rotation of the digit-piece and a ratchet and pawl for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member, the pawl being laterally fixed and having a fixed pivot and the ratchet being on the digit-piece and shiftable therewith into and out of line with said pawl.

22. In actuating mechanism for calculating-machines, a digit-piece rotatable backward and forward and shiftable so as to occupy two positions laterally, said digit-piece being active when in one lateral position and non-active in the other; and a ratchet-and-pawl device for preventing rotation of said digit-piece when the same is in one of its two lateral positions, one part of the ratchet-and-pawl device being on said digit-piece and the other part being

stationary, and the parts of the ratchet-and-pawl device being out of line with each other when the digit-piece is on one lateral position, and in line with each other when the digit-piece is in the other lateral position, whereby the digit-piece may freely rotate except in one direction when in one lateral position, for the purpose described.

23. In actuating mechanism for calculating-machines, a digit-piece, a pawl and a reciprocatory and shiftable ratchet operated by said digit-piece and connected thereto for arresting the movement thereof, said ratchet being shiftable into and out of line with said pawl and designed to move forward when out of line with said pawl and backward when in line therewith, and the teeth of said ratchet being so faced as to engage said pawl only when said ratchet moves in a forward direction in line therewith.

24. In actuating mechanism for calculating-machines, a digit-piece rotatable backward and forward and shiftable so as to occupy two positions laterally, said digit-piece being active when in one lateral position and non-active in the other; a pawl; and a ratchet shiftable into and out of line with said pawl said ratchet being reciprocatorily mounted and operated by said digit-piece and connected thereto for preventing the rotation thereof when the pawl is in engagement with said ratchet.

25. In actuating mechanism for calculating-machines, a digit-piece rotatable back and forth and shiftable so as to occupy two positions laterally, said digit-piece being active when in one lateral position and non-active in the other; a pawl; and a ratchet mounted on

said digit member and shiftable therewith into and out of line with said pawl, said ratchet being adapted to arrest the digit-piece and being designed to be out of line with said pawl when said digit member is rotating forward, and in line with said pawl when said digit-piece is rotating backward, and the teeth of said ratchet being faced so as not to engage said pawl when said digit-piece is rotating backward, but to engage said pawl when said digit member is rotating forward.

26. In actuating mechanism for calculating-machines, a rotatable universal member rotating different amounts depending upon the value of the digit to be registered; a digit-piece rotatable forward and backward for actuating the same, said digit-piece being shiftable into and out of connection with said universal member; means for rotating said digit-piece backward and forward; means for shifting said digit-piece into connection with the universal member for the forward rotation of said digit-piece and out of connection with said universal member for the backward rotation of said digit-piece; means for preventing the accidental shifting of said digit-piece; and means for preventing the forward rotation of said digit-piece when the latter is out of connection with said universal member.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

HYMAN ELI GOLDBERG.

Witnesses:

HOWARD M. COX,
W. W. PEET.